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ABSTRACT

Background information on the testing program, administration details, and a description of the test are provided. The test, intended for administration in June 1986 to third-grade students in Alberta, Canada, consists of two sections. Section 1 is divided into two parts. Part A contains 25 questions covering numeration, geometry, and graphing; 12 sample items are presented in this document. Part B also contains 25 questions covering operations and properties, measurement, and problem solving strategies; 12 sample items are presented. Section 2 consists of four basic facts tests in addition, subtraction, multiplication, and division, with each test having 32 items; eight sample items for each operation are included. The emphasis given to the subject matter is 78% and to problem solving skills is 22%. Appendices provide key and question information, including the curriculum objective and cognitive level of the item, and lists of problem solving strategies. (MNS)

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ED279555

Student Achievement Testing Program

Grade 3 Mathematics

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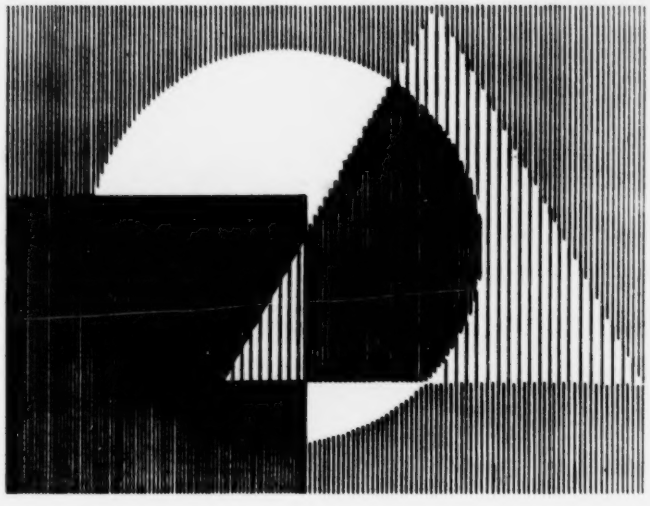

1985-86 School Year

Alberta
EDUCATION
Student Evaluation Branch
Published September 1985

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SE 017 836

This bulletin contains general information about the 1986 Student Achievement Testing Program and information specific to the Grade 3 Mathematics Achievement Test. Additional copies of this bulletin may be obtained by telephoning 427-2948.

DISTRIBUTION: Superintendents of Schools • School Principals and Teachers • The Alberta Teachers' Association • Alberta School Trustees' Association • Officials of Alberta Education • General Public upon Request

September 1985

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PURPOSE OF THE BULLETIN

The Grade 3 Mathematics Achievement Test will be written on June 10, 1986. This bulletin includes specific information about the design of the Grade 3 Mathematics Achievement Test.

Teachers should also refer to the publication *Grade 3 Mathematics Curriculum Specifications* (Revised, July 1984), which presents the specific content and objectives from which the test questions are developed.

Students should have access to the information in this bulletin, particularly to the sample questions.

Questions or comments regarding this bulletin should be addressed to:

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Purpose of the Achievement Testing Program

The Achievement Testing Program provides Alberta Education, school jurisdictions, and the public with information significant at the provincial and local levels about student knowledge, understanding, and skills in relation to program objectives. This program is not intended to provide information to be used for student placement or promotion.

The achievement tests are administered on a four year cycle in four subject areas: language arts, social studies, mathematics and science; and at three grade levels: 3, 6, and 9.

Nature of the Achievement Testing Program

The achievement tests are specific to the program of studies prescribed by the Minister of Education. Curriculum specifications for each subject area, provided by the Curriculum Branch and the Language Services Branch of Alberta Education, identify the major content areas, the specific learning objectives within each area, and the emphasis that each objective is to receive. The test questions reflect these curriculum specifications.

Classroom teachers from across the province are extensively involved in developing and field-testing the questions. The student responses are analysed after field-testing to determine each question's discriminating power and level of difficulty. Questions may undergo several revisions before they appear on the achievement test.

The final draft of each test is examined by an Achievement Test Review Committee that includes representatives of The Alberta Teachers' Association, the Conference of Alberta School Superintendents, Alberta's post-secondary institutions and Alberta Education.

Students Tested

The results of the Achievement Testing Program are significant at the school jurisdiction level. In most school jurisdictions, total population testing is required to obtain significant results. However, in large school districts, testing with the school as a sample unit is an alternative if a board motion is forwarded to Alberta Education prior to April 1, 1986. Alberta Education will assume total population testing unless a board motion is received.

Exemptions from the Achievement Testing Program

All students who have been taught the subject being tested are expected to participate in the Achievement Testing Program. Any exceptions should be identified by the principal and approved by the superintendent of schools.

The only students who may be excused from participating are those for whom the test is inappropriate. That is:

1. Students who are enrolled in an approved program that has been designed for special needs students.
2. Students who were taught the subject being tested in another semester or year.
3. Students who are enrolled in an English as a Second Language program.
4. Students who are being taught the specific subject being tested (mathematics, science or social studies) in a language other than English.

Note: All Grade 9 students are expected to write the Grade 9 English Language Arts Achievement Test in 1986 regardless of the language of instruction.

Exemptions for reasons other than those outlined must be approved by the Director of Student Evaluation Branch.

Students Receiving Instruction in French

French language arts achievement tests and French translations of the mathematics, science, and social studies achievement tests are available for grades 6 and 9 according to the schedule on page 4. School jurisdictions that intend to have their students write achievement tests in French must notify Alberta Education prior to April 1, 1986.

Administration of the Achievement Testing Program

The Achievement Testing Program is administered in accordance with *Examination Regulation 531/82* pursuant to Section 11(1)(g) of the *School Act*. The achievement tests must be administered on the scheduled dates and may not be re-scheduled.

The achievement tests should remain unopened until the time of administration. Duplication of any test materials, including the test booklets and answer sheets, is expressly forbidden.

Immediately following the administration of the scheduled achievement tests, the principal must ensure that test booklets & answer sheets are forwarded to school board offices. The school board is responsible for collecting and forwarding all test materials containing students responses to the Student Evaluation Branch. Further details regarding procedures for returning these materials to the Branch will be issued with delivery of the achievement tests. For private schools, the Regional Offices of Alberta Education assume the responsibility to collect and forward test materials to Student Evaluation Branch. All unused testing material may be retained by the school jurisdiction.

Alberta Education will supervise the scoring of all achievement tests. The scoring of achievement tests by school personnel prior to returning test materials to the Student Evaluation Branch is a violation of the Examination Regulations and contrary to the intent of the Achievement Testing Program.

During 1986, the achievement tests will be administered according to the following schedule:

June 10, 1986

Grade 3 Mathematics

Grade 6 Science*

Grade 9 English Language Arts

June 12, 1986

Le français au secondaire - 9e année

In 1987, the achievement tests will be administered according to the following schedule:

June 9, 1987

Grade 3 Science

Grade 6 Mathematics*

Grade 9 Social Studies*

* A French translation of this test is available. The French translation must be administered at the same time as the English version.

Reporting the Achievement Test Results

The provincial report presents the overall results for the province on major curriculum dimensions. Each jurisdiction will receive a district profile of student achievement to parallel the provincial report, as well as guidelines for interpreting the jurisdictional results in relation to provincial norms. Alberta Education will not issue individual statements of results to students; individual student profiles will be returned to superintendents.

In 1986, provincial reports will not be prepared for the French translations of the tests or for the Grade 9 French Language Arts Achievement Test.

The results of the 1986 Achievement Testing Program will be available in October 1986.

DESCRIPTION OF THE GRADE 3 MATHEMATICS ACHIEVEMENT TEST

General Description

The test consists of two sections. Section 1 is divided into two parts: Part A consists of 25 questions covering numeration, geometry and graphing; Part B consists of 25 questions covering operations and properties, measurement and problem-solving strategies. Section 2 consists of four basic-fact tests in addition, subtraction, multiplication and division. Each basic-fact test contains 32 questions.

The total time allotted for writing the Grade 3 Mathematics Achievement Test is 58 minutes: 25 minutes for each part of Section 1, and two minutes for each basic-fact test of Section 2. There are rest breaks between Part A and Part B, and between Section 1 and Section 2.

All questions are multiple-choice with four alternatives. Students will answer questions in the test booklet by filling in a small circle beside the correct response. There is no separate answer sheet.

Students will require HB pencils, erasers and scrap paper.

Students may NOT use calculators or rulers while writing this test.

Content of the Test

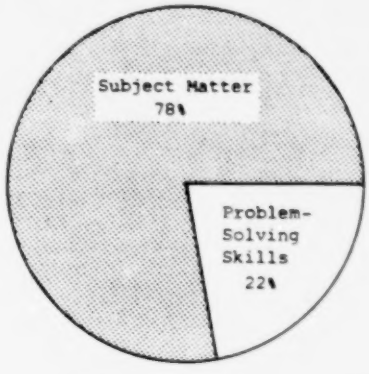
The four major components of the Grade 3 Mathematics curriculum and the emphasis that each is to receive according to the *Grade 3 Mathematics Curriculum Specifications* (revised, July 1984) form the basis for the achievement test. These four components are:

Component	Emphasis (%)
Subject Matter	60
Problem-Solving Skills	20
Psychomotor Skills	10
Attitude	10

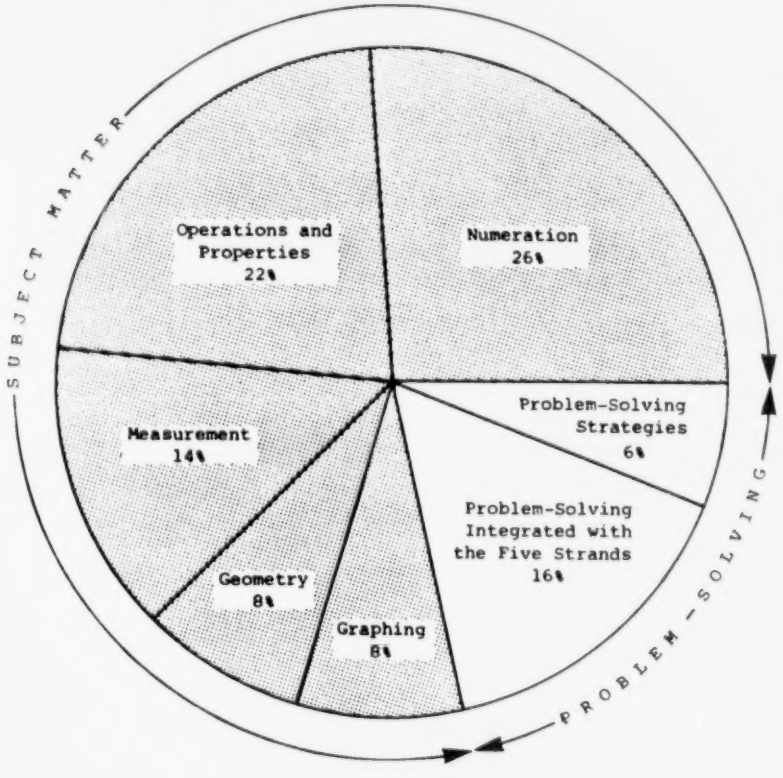
The scope of the Grade 3 Mathematics Achievement Test is limited to subject matter and problem-solving skills components. The psychomotor skills and attitudinal components will be reflected in the teacher's evaluation of the students.

Section 1: Subject Matter and Problem-Solving Skills

The emphasis given to the subject matter and problem-solving skills components is shown in the circle graph below.



The subject matter component covers five strands: numeration, operations and properties, measurement, geometry and graphing. The problem-solving skills component is divided into two parts: problem-solving integrated with subject matter and problem-solving strategies. The emphasis given to each subject matter strand and to each part of the problem-solving skills component is shown in the circle graph below.



Questions on subject matter measure student achievement at three cognitive levels: knowledge, comprehension and application. Explanations of these cognitive levels and problem-solving strategies are given in Appendices A and B.

This section of the test is divided into two parts to be administered at two sittings.

Blueprint for the Achievement Test

The distribution of numbers of questions that test subject matter and problem-solving skills is presented in the table below.

Content	Subject Matter by Cognitive Levels			Total Subject Matter	Problem Solving	Total No. of Questions
	Knowledge	Comprehension	Application			
Part A						
Numeration	4	8	1	13	2	15
Geometry	1	1	2	4	1	5
Graphing	1	1	2	4	1	5
Total	6	10	5	21	4	25
Part B						
Operations and Properties	4	5	2	11	2	13
Measurement	1	4	2	7	2	9
Problem-Solving Strategies	-	-	-	-	3	3
Total	5	9	4	18	7	25
TOTAL SECTION 1	11	19	9	39	11	50

Section 2: Basic Facts

This section of the test consists of four timed tests. They measure student mastery of basic facts involving sums and minuends to 18, and products and dividends to 45.

The order of the basic-fact tests, the number of questions on each test, and the time allotted to write each test are presented in the table below.

Basic-Fact Tests

Operations	No. of Questions	Time in Minutes
Addition	32	2
Subtraction	32	2
Multiplication	32	2
Division	32	2

Basic-fact tests measure students' speed as well as accuracy. It is not expected that all students will be able to finish all the questions. However, students should be encouraged to do as many questions as they can.

To measure students' speed on basic-fact questions, it is essential that students answer questions in the correct sequence. The layout of basic-fact tests has been designed to facilitate this.

Sample Questions

Sample questions that reflect the nature and complexity of the questions that will appear on the test are presented on the following pages. The print size on the actual achievement test will be slightly larger than that shown in this bulletin.

Teachers are encouraged to familiarize their students with the type of questions that will appear on the achievement test by having them work through the sample questions.

Please note that this collection of questions does not represent the test emphasis as presented in the blueprint.

SECTION I: PART A

1. The number 251 is read as

- ○ two fifty-one
- ○ twenty five one
- ○ twenty five hundred one
- ○ two hundred fifty-one

2. What numbers come next in this pattern?

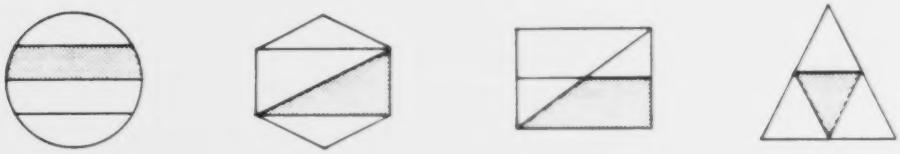
50, 75, 100, ___, ___

- ○ 105, 110
- ○ 110, 120
- ○ 125, 150
- ○ 200, 300

3. 874 is the same as

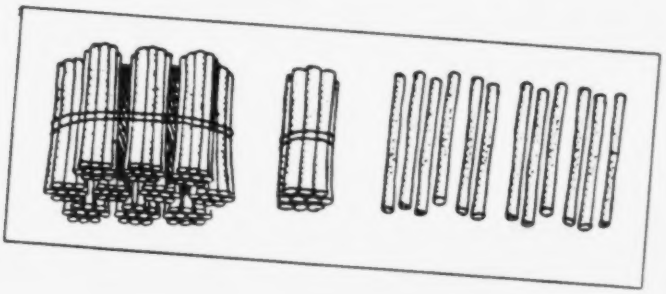
- ○ (8 x 100) + (7 x 10) + (4 x 1)
- ○ (8 x 100) + (7 x 1) + (4 x 1)
- ○ (8 x 100) + (7 x 0) + (4 x 1)
- ○ (8 x 10) + (7 x 10) + (4 x 10)

4. Which picture is $\frac{1}{4}$ shaded?

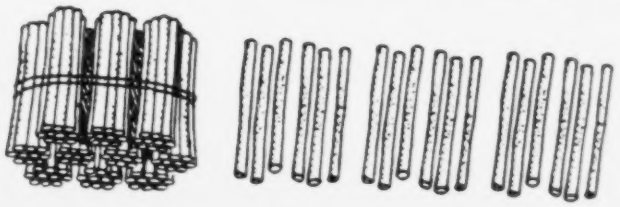


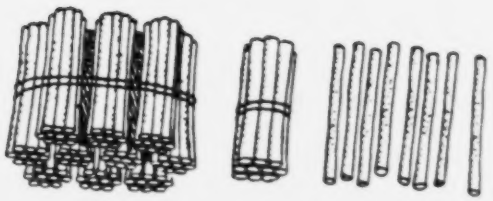
○ ○ ○ ○

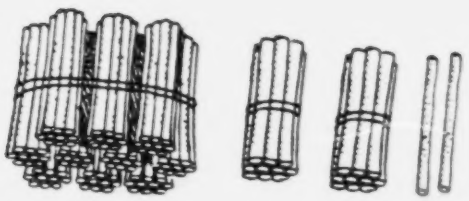
5. Look at the picture and find out how many sticks are in the box.

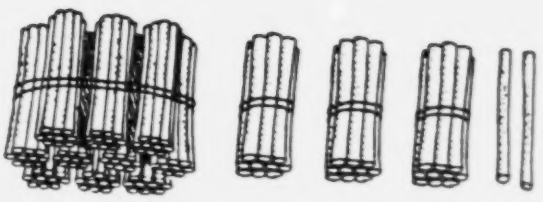


Which group has the same number of sticks as in the box?

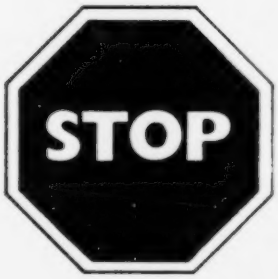
○ 

○ 

○ 

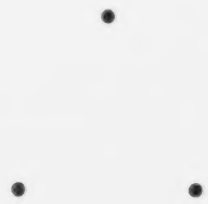
○ 

6. This sign has a shape of



- ○ an octagon
- ○ a pentagon
- ○ a hexagon
- ○ a rectangle

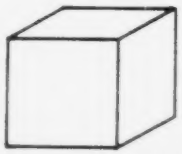
7. If you join these dots by drawing 3 straight lines,



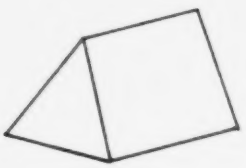
what shape would you get?

- ○ A cone
- ○ A circle
- ○ A triangle
- ○ A rectangle

8. You need 12 straws to make this shape.

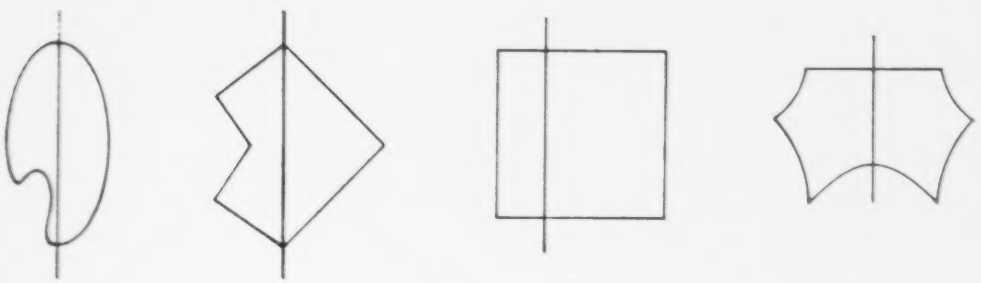


How many straws do you need to make this shape?



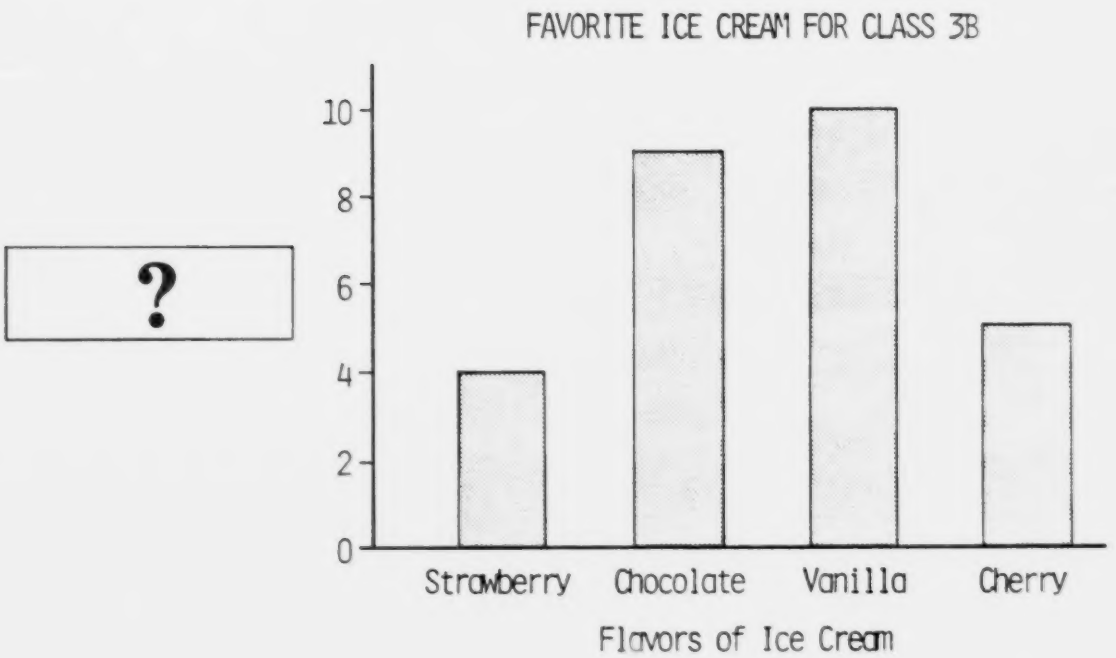
- ○ 12
- ○ 9
- ○ 8
- ○ 6

9. Which picture has a line of symmetry?



○ ○ ○ ○

10. This graph is not complete.

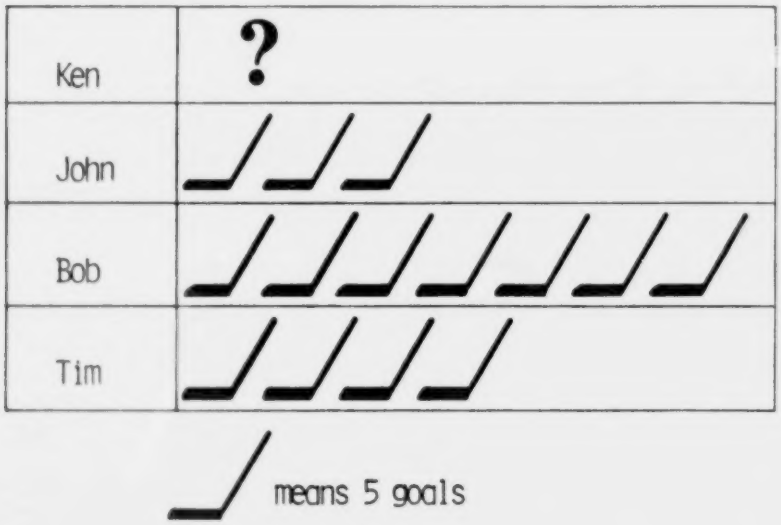


What label is missing from the graph?

- ○ Flavors of Ice Cream
- ○ Scoops of Ice Cream
- ○ Number of Children
- ○ Names of Children

11. The graph below is not complete.

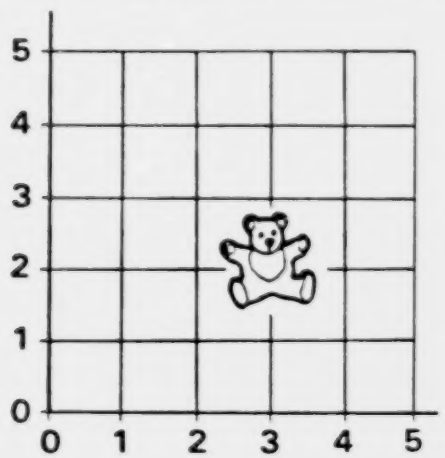
GOALS SCORED BY THE BOYS' TEAM



If Ken scored 30 goals, how many would you put on the graph to show his score?

- ○ 3
- ○ 5
- ○ 6
- ○ 30

12. Where is the bear on this grid?



- ○ Across 2, up 3
- ○ Across 3, up 2
- ○ Across 3, up 3
- ○ Across 4, up 3

SECTION I: PART B

13. Find the sum.

$$\begin{array}{r} 745 \\ 8 \\ +\ 96 \\ \hline \end{array}$$

- ○ 849
- ○ 839
- ○ 749
- ○ 739

14. Find the difference.

$$\begin{array}{r} 489 \\ -\ 26 \\ \hline \end{array}$$

- ○ 63
- ○ 463
- ○ 515
- ○ 4513

15. Joan had 165 marbles.
She lost some of them.
Joan's mother gave her 50 more.
To find out how many marbles Joan has, you need to know

- ○ the colors of marbles she lost
- ○ the number of marbles she lost
- ○ how large her marbles are
- ○ how much she likes her marbles

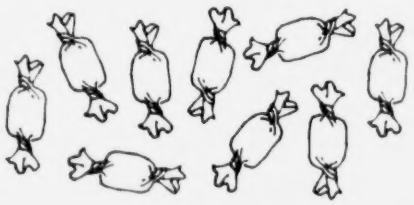
16. Jane has 124 stickers.
Mary has 359 stickers.
How many more stickers does Mary have than Jane?

- ○ 125
- ○ 135
- ○ 235
- ○ 483

17. If you add two numbers, the answer is 35.
If you subtract them, the answer is 5.
The two numbers are

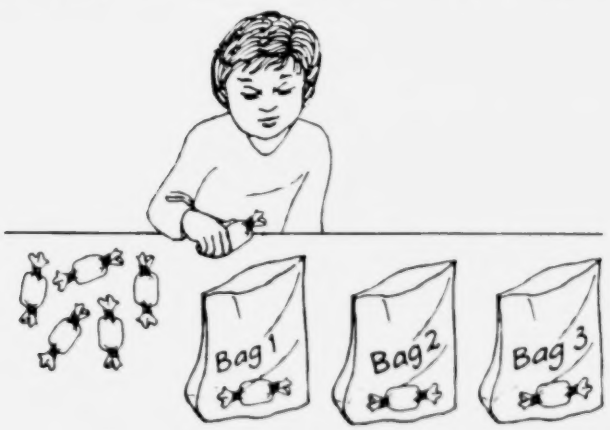
- ○ 35 and 5
- ○ 30 and 5
- ○ 25 and 10
- ○ 20 and 15

18. Jordan had 9 candies.



He wanted to put the same number of candies in each of these bags.

He put one candy in Bag 1, one in Bag 2 and one in Bag 3.

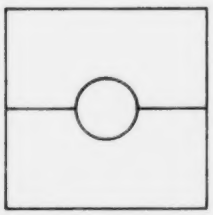


He did this until he had 3 candies in each bag.

What other way could Jordan have figured out how many candies to put in each bag?

- ○ Add 9 and 3
- ○ Subtract 3 from 9
- ○ Multiply 9 by 3
- ○ Divide 9 by 3

19. Kim threw bean bags at this target.

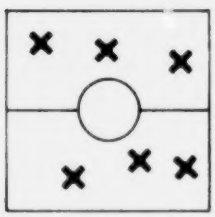


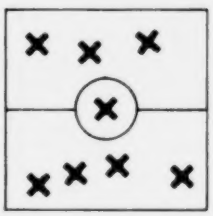
One bag hit inside the circle.

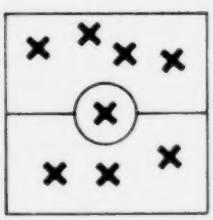
Three bags hit above the circle.

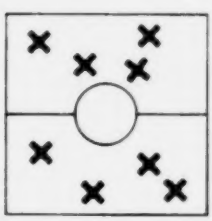
Four bags hit below the circle.

Which picture below tells the story?

○ 

○ 

○ 

○ 

20. What goes in the ☐ ?

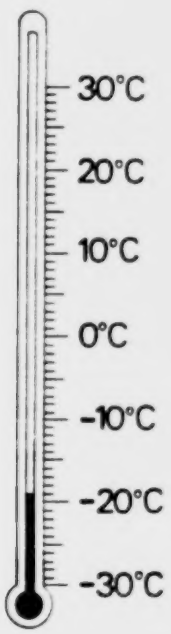
$9 \times 5 = 5 \times$ ☐

- ○ 45
- ○ 14
- ○ 9
- ○ 5

21. The correct order of the 3 months that come right after June is

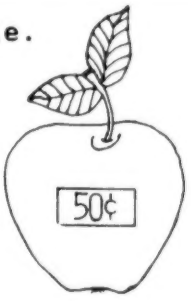
- ○ August, July, September
- ○ August, September, July
- ○ July, August, September
- ○ July, September, August

22. The temperature shown is



- ○ -19°C
- ○ 19°C
- ○ -21°C
- ○ 21°C

23. Jenny bought this apple.



She gave the clerk these coins.

The clerk gave Jenny back these coins.

Did Jenny get the correct change?

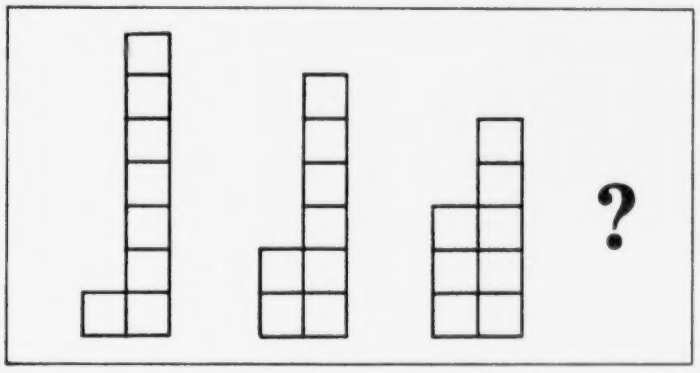
○ Yes.

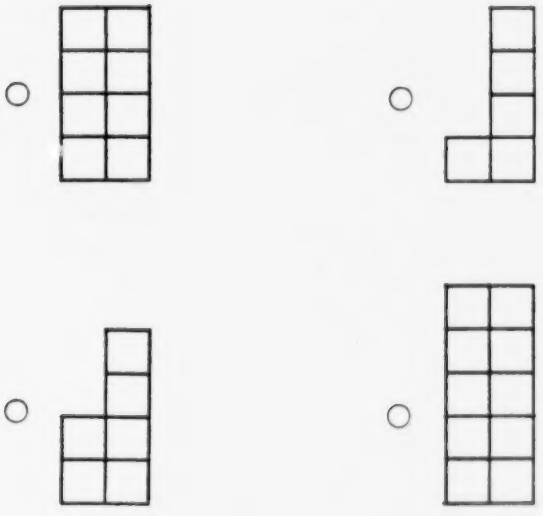
○ No, the change should be

○ No, the change should be

○ No, the change should be

24. What would be the next figure in this group?





SECTION II: BASIC FACTS

ADDITION

1 2 + 3 ○ 3 ○ 4 ○ 5 ○ 6	2 3 + 5 ○ 8 ○ 9 ○ 13 ○ 15	3 5 + 0 ○ 0 ○ 5 ○ 6 ○ 50	4 8 + 4 ○ 12 ○ 13 ○ 14 ○ 16
5 1 + 2 ○ 2 ○ 3 ○ 4 ○ 12	6 9 + 9 ○ 9 ○ 16 ○ 17 ○ 18	7 4 + 8 ○ 10 ○ 11 ○ 12 ○ 14	8 9 + 6 ○ 13 ○ 14 ○ 15 ○ 16

SUBTRACTION

1 3 - 1 ○ 1 ○ 2 ○ 3 ○ 4	2 8 - 4 ○ 2 ○ 3 ○ 4 ○ 5	3 11 - 6 ○ 3 ○ 4 ○ 5 ○ 7	4 17 - 8 ○ 6 ○ 7 ○ 8 ○ 9
5 4 - 0 ○ 0 ○ 1 ○ 3 ○ 4	6 9 - 7 ○ 2 ○ 3 ○ 4 ○ 7	7 16 - 9 ○ 6 ○ 7 ○ 8 ○ 9	8 7 - 7 ○ 0 ○ 1 ○ 7 ○ 14

MULTIPLICATION

1	2	3	4
$\begin{array}{r} 3 \\ \times\ 2 \end{array}$	$\begin{array}{r} 6 \\ \times\ 3 \end{array}$	$\begin{array}{r} 7 \\ \times\ 6 \end{array}$	$\begin{array}{r} 7 \\ \times\ 0 \end{array}$
○ 3	○ 9	○ 13	○ 0
○ 4	○ 15	○ 36	○ 7
○ 5	○ 18	○ 42	○ 8
○ 6	○ 24	○ 43	○ 70

5	6	7	8
$\begin{array}{r} 4 \\ \times\ 4 \end{array}$	$\begin{array}{r} 4 \\ \times\ 8 \end{array}$	$\begin{array}{r} 1 \\ \times\ 5 \end{array}$	$\begin{array}{r} 9 \\ \times\ 5 \end{array}$
○ 8	○ 12	○ 0	○ 14
○ 16	○ 32	○ 1	○ 35
○ 24	○ 34	○ 5	○ 40
○ 44	○ 38	○ 6	○ 45

DIVISION

1	2	3	4
$2\overline{)4}$	$4\overline{)24}$	$6\overline{)30}$	$1\overline{)3}$
○ 2	○ 4	○ 4	○ 1
○ 6	○ 5	○ 5	○ 2
○ 8	○ 6	○ 6	○ 3
○ 24	○ 20	○ 24	○ 4

5	6	7	8
$2\overline{)10}$	$4\overline{)16}$	$5\overline{)45}$	$9\overline{)36}$
○ 4	○ 4	○ 5	○ 3
○ 5	○ 6	○ 8	○ 4
○ 8	○ 8	○ 9	○ 9
○ 10	○ 12	○ 40	○ 27

Key and Question Information

Item	Key	Cognitive Level	Program Component	Curriculum Objective
1	D	Knowledge	Subject Matter	Numeration - reads numerals
2	C	Comprehension	Subject Matter	Numeration - identifies multiples by counting by 25s
3	A	Comprehension	Subject Matter	Numeration - writes numbers in expanded notation
4	D	Application	Subject Matter	Numeration - identifies proper fractions from pictorial representation
5	C	-	Problem-Solving	Numeration - interprets a picture and identifies the number of 100s, 10s and 1s and regroups Problem-Solving Strategies - Step 3 - identifies and applies relationship - Step 4 - checks the answer
6	A	Knowledge	Subject Matter	Geometry - classifies a two-dimensional figure
7	C	Comprehension	Subject Matter	Geometry - constructs simple two-dimensional figures
8	B	-	Problem-Solving	Geometry - constructs simple three-dimensional objects Problem-Solving Strategies - Step 3 - uses manipulatives - uses logic and reason - makes diagrams
9	D	Comprehension	Subject Matter	Geometry - identifies symmetric figures
10	C	Comprehension	Subject Matter	Graphing - identifies the axes - completes the construction of a simple bar graph

Item	Key	Cognitive Level	Program Component	Curriculum Objective
11	C	Application	Subject Matter	Graphing - interprets and constructs pictographs
12	B	Knowledge	Subject Matter	Graphing - locates position of an object on a grid
13	A	Comprehension	Subject Matter	Operations and Properties - adds one-, two- and three-digit numbers with regrouping
14	B	Knowledge	Subject Matter	Operations and Properties - subtracts a two-digit from a three-digit number without regrouping
15	B	-	Problem-Solving	Operations and Properties - adds and subtracts two- and three-digit numbers with regrouping Problem-Solving Strategies - Step 1 - identifies key words - identifies wanted, needed and given information
16	C	Application	Subject Matter	Operations and Properties - subtracts three-digit numbers without regrouping
17	D	-	Problem-Solving	Operations and Properties - adds and subtracts two-digit numbers with and without regrouping Problem-Solving Strategies - Step 2 & 3 - guesses and checks - organizes information (chart) - Step 4 - checks the answer
18	D	-	Problem-Solving	Operations and Properties - identifies division situations Problem-Solving Strategies - Step 4 - looks for alternative ways to solve the problem

Item	Key	Cognitive Level	Program Component	Curriculum Objective
19	B	-	Problem-Solving	Problem-Solving Strategies - Step 1 - identifies key words - acts it out - draws a diagram
20	C	Knowledge	Subject Matter	Operations and Properties - understands the commutative property of multiplication
21	C	Knowledge	Subject Matter	Measurement - orders months of the year
22	A	Comprehension	Subject Matter	Measurement - reads the Celsius thermometer to one degree intervals and uses the symbol °C
23	D	-	Problem-Solving	Measurement - counts collections of coins up to $1.00 - makes purchases and change up to $1.00 Problem-Solving Strategies - Step 4 - checks the answer
24	A	-	Problem-Solving	Problem-Solving Strategies - Step 2 & 3 - uses manipulatives - identifies and applies relationships - applies patterns

APPENDIX A: EXPLANATION OF COGNITIVE LEVELS

Knowledge

Knowledge includes exercises involving immediate recall and routine manipulation. This level represents primarily the outcomes which do not require the student to use decision-making or complex memory.

Comprehension

Knowledge of concepts. A concept is an abstraction and as such requires complex decision-making.

Translations. Comprehension involves translating from the concrete to pictorial to symbolic, or in reverse order.

Application

Includes the ability to solve problems involving learned skills and concepts.

Involves the ability to recognize patterns and relationships.

APPENDIX B: PROBLEM-SOLVING STRATEGIES

Step 1. Understanding the Problem

- uses manipulatives
- interprets pictures
- looks for patterns
- identifies key words
- acts it out
- draws diagrams
- restates the problem in your own words
- asks relevant questions
- identifies wanted, given and needed information
- identifies extraneous information
- considers alternative interpretations

Step 2. Developing a Plan

- acts it out
- uses manipulatives
- collects and organizes information (charts, graphs)
- applies patterns
- chooses and applies the appropriate operation
- writes and solves a number sentence
- guesses and checks
- identifies and applies relationships
- makes diagrams and models
- uses a simpler problem
- uses logic or reason
- constructs flow charts

Step 3. Carrying out the Plan

- acts it out
- uses manipulatives
- collects and organizes information (charts, graphs)
- applies patterns
- chooses and applies the appropriate operation
- writes and solves a number sentence
- guesses and checks
- identifies and applies relationships
- makes diagrams and models
- uses a simpler problem
- uses logic and reason
- constructs flow charts

Step 4. Looking Back

- states an answer to the problem
- restates the problem with the answer
- checks the answer
- determines the reasonableness of the answer
- explains the answer
- reviews the solution process
- considers the possibility of other answers
- looks for alternative ways to solve the problem
- makes and solves similar problems
- generalizes solutions